Synopsis

Micropropagation and Phytochemical studies on two endangered ethnomedicinal plant species of South Chhotanagpur division of Jharkhand

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STATE OF ART

India is all over renowned for its rich biodiversity and cultural heritage. It is home to a wide range of medicinal plants. Since the beginning of civilization intentionally or unintentionally man has been using plants for its medicinal benefits to cure and heal diseases. Medicinal plants have been playing a vital role in various cultures throughout the history like the Sumerians, Ancient Egypt, Chinese Medicine, Greek-Roman traditions and Indian Ayurveda. These traditional practices have laid and built the foundation for modern pharmacology. These medicinal plants have been discovered, identified, preserved and used by various ethnic and tribal communities and has been passed onto their family for generations. These traditional practices are not only helping in preserving the knowledge but also promoting cultivation and harvesting of these ethnomedicinal plants ensuring that they are available to the future generation. These ethnomedicinal plants have been used by the indigenous communities for over centuries for healing various diseases and illness. Ethnomedicinal plants have played an integral part in traditional medicinal knowledge and healing practices like Ayurveda[1], Siddha and Unani[1] as well as Tribal medicines.

Jharkhand a state situated in the eastern region of India[2] is very well known for its lush greenery and dense and wild forests. This state is a home to a dense range of flora and fauna[3]. It is also a home to a variety of ethnomedicinal plants with multiple other plants. According to the census of 2011 the tribal population of Jharkhand is 26%[4]. This state is a home to multiple indigenous communities like Santhal, Oraon, Munda, Ho[4], Kharia etc. These indigenous communities have been known to use the ethnomedicinal plants for herbal medicines using their traditional knowledge and practices to heal ailments.

PROBLEM TO BE INVESTIGATED:

Overgrazing, urbanization and unsustainable harvesting of ethnomedicinal plants have led to serious threats of extinction. With the increase in the demand of these ethnomedicinal plants it has led to unsustainable harvesting practices and over exploitation which is posing a significant threat on the healthcare as well as biodiversity. Agriculture and deforestation have resulted in the loss of natural habitats further threatening these ethnomedicinal plant species like *Vitex peduncularis* Wall. Ex Schauer[37] *and Gloriosa superba* L[38]. These plants have been very widely used for its ethnopharmacological uses in the traditional medicine that over the

decades it has led to over-exploitation. *Vitex peduncularis* Wall. Ex Schauer is very famous for its anti-inflammatory properties for treating conditions like malaria and fever. The bark of *Vitex peduncularis* Wall. Ex Schauer is used to make decoctions and beverages[5], leading to its overharvesting and over-exploitation as well. When seeds or flowering parts are used by the indigenous communities for ethnomedicine, the multiplication of the plants becomes difficult. *Gloriosa superba* L.[34,35,36] is an ongoing research subject in the field of Cancer Research[6]. It is extensively used among tribes in treating snake bites. It also used to treat various diseases like chronic ulcers, hemorrhoids, bruises, colic. The plant juice is used as an antimalarial agent[6]. Its roots are used to induce abortion[7]. Over the years sudden change in the climatic conditions due to several environmental factors has also played a major impact on getting these ethnomedicinal plant species endangered.

Synthetic drugs can have adverse and serious effect on the body. They have multiple side effects. And these side effects can range anywhere from mild to severe. The most common side effects of synthetic drugs are headache, nausea and vomiting. But in the longer run it can lead to serious health conditions. The active ingredients in these drugs are chemicals that if not taken under strict and proper supervision can lead to major life threats. They can also lead to hallucinations and change in mood and behavior which can sometimes interrupt daily life activities and social and human interactions. Long term use can lead to addiction and dependency that can result in misuse, overuse and health consequences. They are also an environmental threat as manufacturing and processing of these drugs can have negative impacts. It involves a lot of toxic chemicals and continuous exposure to the air and dust in the pharmaceutical industries can lead to serious health hazards. If proper safety measures are not taken during manufacturing and processing then, it can also lead to physical, biological and chemical health hazards. Improper disposal of waste in the water can lead to contamination resulting in water and thermal pollution as well as loss of marine life. Synthetic drugs are very expensive. They aren't cost effective and hence they are not accessible to the economical weaker sections. The people with lower income cannot afford these high end expensive drugs. Ethnomedicinal plants are more accessible and affordable, especially in the rural areas when modern healthcare facilities are limited. They are environment friendly and do not harm the nature. As they are derived from natural sources even the manufacturing and processing of these medicines which are derived from the ethnomedicinal plants does not pose any kind of threat towards the nature or biodiversity. Long term use does not develop any kind of drug addiction or dependency.

A lot of ethnomedicinal plant species have become endangered due to over-exploitation and habitat loss. Ethnomedicinal medicines are derived from nature which means they contain natural compounds rather than synthetic compounds. It is a storehouse to numerous bioactive compounds which produces an enhanced effect. Also due to cultural relevance and being deeply rooted in the ethnic cultures it builds a sense of trust, faith and belief which also makes ethnomedicinal drugs more acceptable among the communities.[8,9] So herbal medicines are needed to reduce side effects and help with healing. Hence natural drugs must be introduced and restored with the help of ethnomedicinal plants. The knowledge of traditional healers comprises of identification, preparation and application of various these ethnomedicinal plants for treating various diseases. Documentation of ethnomedicinal knowledge is necessary to prevent the loss of traditional wisdom as it will help in unlocking the potential for improved healthcare[7].

OBJECTIVES OF THE INVESTIGATION:

- Collection and Identification of the selected ethnomedicinal plants (*Vitex peduncularis* Wall. Ex Schauer *and Gloriosa superba* L. **)** with the help of Herbal practitioners and Taxonomists under the status of IUCN.
- To perform phytochemical analysis (qualitative and quantitative analysis) of the selected plants.
- To perform Tissue culture technique through Micropropagation.

MOTIVATION:

The motivation behind working on this topic comes from multiple viewpoints like cultural, social, scientific, economic and environmental reasons. Researching on these endangered ethnomedicinal plants have great potential and future in pharmaceutical industries as numerous drugs can be discovered. It will also give a rise to multiple job opportunities strengthening the economical weaker sections. Understanding these plants will

help in creating more sustainable healthcare options. With the rise in the health awareness among the general audience exploring ethnomedicinal plants is way to address health challenges as people are relying more on natural and traditional medicines rather than the synthetic ones. Studying on these will help and encourage the conservation of biodiversity as it will prevent the over-exploitation of these plant species. In the meanwhile the traditional knowledge prevailing in the indigenous communities since generations must be duly and righteously documented before it is lost forever. Studies and techniques like micropropagation will help in producing pathogen free plants all year round irrespective of seasonal changes which will help in a great deal.

HYPOTHESIS:

Over the years due to over-exploitation[10] and illegal trade[12], pollution, climate change[13] and habitat destruction[9] these ethnomedicinal plants have been constantly under huge threat. There is a need of revival of these ethnomedicinal endangered plants to produce herbal medicines using the traditional methods. Herbal medicines are derived from various parts of the plants such as roots, bark, seeds, leaves and flowers[13]. Using tissue culture[10,29] and micro propagation techniques[10,30] can help in offering numerous benefits like mass propagation, disease free plants, conservation of rare species and genetic improvement[10]. These methods are also useful in improving crop yields, preserving biodiversity and advancing agricultural and pharmacological research[14]. Plant tissue culture[31] allows rapid production of identical plants from a small part of plant material. The propagation techniques can help in producing disease free and better quality plants. It helps in conservation of rare and endangered plants. And unlike traditional cultivation and farming tissue culture[32] can be done whole year round irrespective of season and climate.

Ethnomedicinal plants are used to treat various diseases starting from common diseases like cold, cough, fever, diarrhea to neurological disorders, menstrual problems and cancer. They can also be used to boost immunity, increase or decrease weight and sleep related issues like insomnia and sleep apnea[7]. Herbal medicines are made from ethnomedicinal plants using traditional knowledge and hence they are gentler on the body than allopathic medicines. They are better than synthetic drugs as they are considered less toxic and having less side-effect[15]. The ultimate goal of any medicine is their non-toxicity, effectiveness, specificity,

stability and potency. Herbal medicines are cost effective[16] and accessible with natural healing. Production of herbal medicines can also provide livelihood in the rural areas and boost their economy.

RESEARCH DESIGN AND METHODOLOGY

MATERIAL

- **PLANT MATERIAL:** The sample plant needs to be selected from various different families belonging from the ethnomedicinal group for experimental purposes. The information will be gathered from various reviews and literature from indexed journals[17]. The collection of sample will be done under the supervision of experts and taxonomists.
- **FIELD SURVEY:** An investigation, exploration and research[18] will be done amongst the herbal medicine and ayurvedic practitioners and suppliers[13]. Medical herbalists from various ethnic and tribal communities advices and suggestions will be taken into notes and consideration[19]. Naturopathic doctor's guidance and recommendations will be taken who have deep understanding of ethnomedicinal plants backed up by scientific knowledge.

METHODOLOGY:

- **Phytochemical screening and identification of bioactive compounds[20]:**
  Qualitative Analysis: To analyze the plant extracts and to identify and evaluate their chemical compounds, especially secondary metabolites[21].
  Quantitative Analysis: To examine the presence of total Phenols,Tannins, Flavonoids and Saponins to detect its therapeutic potential. The presence of phytochemicals needs to be confirmed by using various standard protocols[11] like HPLC / GC-MS.

- **Plant Tissue Culture:** Techniques like micropropagation and callus culture[33] to be used to propagate plants to rapidly multiply plants to conserve rare and endangered

plants[22] to help produce natural medicines. Vegetative propagation of the selected plants will also be accomplished.

MATERIALS :

Plant Material (Explant), Culture Media, Plant Growth Regulators, pH indicators, Sterilizing agents, Solvents, Reagents, Chemicals, Serums, Antibiotics, Antimycotics, Hormones, Buffers, Enzymes, Cryoprotectants.

TOOLS:

FOR PHYTOCHEMICAL SCREENING:

Mortar and Pestle, Separating Funnel, Glassware, Water Bath, pH meter, Desiccator, Rotatory evaporator, Sonicator, Vortex Mixer, Centrifuge, Hot plate, Bunsen Burner, TLC Chamber, Column chromatography equipment, Spectrophotometer (UV-Vis), High performance Liquid Chromatography (HPLC) .

FOR PLANT TISSUE CULTURE:

Scalpels and Blades, Forceps, Scissors, Petri Dishes, Test Tubes, Micropipettes and Tips, Glass Beakers and Flasks, Measuring Cylinders, Autoclave, Laminar Air Flow, Alcohol Sprayer, Hot Air Oven, UV Sterilizer, Incubator, pH meter, Orbital shaker, Refrigerator, Parafilm, Compound Microscope, Water Bath.

SIGNIFICANCE OF THE STUDY-

- Herbal medicines are the hour of the need as they are one of the most important sources of healthcare in a lot of communities. They have been used to treat a wide number of diseases since generations as they are full of medicinal benefits. These herbal medicines are derived from these ethnomedicinal plants which are slowly getting endangered[24].
- These endangered plant species need to be preserved to know and understand the traditional knowledge of herbal medicines which have been passed in the indigenous communities for generations after generations. It holds the vision for natural remedies which modern science is yet to explore. Research into these plants can lead to great scientific innovation in the pharmaceutical industries[25].
- Conservation of these endangered ethnomedicinal plants will also help in the conservation of biodiversity and restore the ecological balance. It will also enrich the diversity of flora in the state[27].
- Many ethnomedicinal plants hold economical value[26] as they are traded all over the world for their medicinal properties. They are collected and sold in local and global markets. This can support the livelihood as they can create multiple jobs and strengthen their financial conditions.
- These traditional practices and knowledge also signifies the importance of ethnobotanical knowledge for future medicinal developments[3].

RELEVANCE TO THE PRESENT DAY STUDIES:

Herbal medicines are known to be gentler and have a more calming effect on the body without side effects unlike synthetic drugs. These herbal medicines not only cure the symptoms but also focus on the root cause of illness and help in eradicating them. These days everyone is looking for organic remedies and natural methods for cure[15]. They want a remedy with a natural approach to better their overall health including all the physical, mental and emotional well-being. They are eco-friendly and do not cause any threat or hazard to the environment. They are cost-effective which makes them affordable[18] to each and every one making it a one stop solution. As with every new day there is an increase in the natural and

organic preferences where people prioritize healthy lifestyle choices with minimal chemical use at that time herbal medicines seem to be an effective and better choice.

FUTURE WORK:

With increasing awareness in people for choosing a healthy lifestyle herbal medicines have a great future ahead. The future seems very promising influenced by global demand. The public awareness towards natural remedies and its benefits has shifted general public's preferences from the synthetic drugs. The need of natural and organic remedies in the common masses should be addressed. A holistic approach with scientific innovation can lead to meet the growing and increasing demands and desires of the health conscious people. Cultural beliefs and family traditions also influence the popularity of traditional medicines. The common population has started viewing traditional medicines as natural and safe. The urge and need for safe, cost-effective and natural healing will lead to a great future of ethnomedicinal plants[28].

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